PROJECT facts

DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY

ADVANCED power SYSTEMS

UNIVERSITY OF NORTH DAKOTA—CONTROLLING TRACE ELEMENT EMISSIONS WITH THE ADVANCED HYBRID PARTICULATE COLLECTOR

PRIMARY PROJECT PARTNER

University of North Dakota's Energy and Environmental Research Center (EERC)
Grand Forks, ND

MAIN SITE

University of North Dakota EERC
Grand Forks, ND

TOTAL ESTIMATED COST

$1,594,260

COST SHARING

DOE	**$1,254,283**
Non-DOE	**$339,977**

Project Description

Harmful substances listed in the Clean Air Act Amendments of 1990 include the group of hazardous air pollutants (HAPs) associated with fine particles. By finding ways to remove these fine particles from combustion products, coal-fired power plants can substantially reduce the emissions of these pollutants.

Electrostatic precipitators (ESPs) are widely used in the coal-based power-generation industry to control particulate HAPs. ESPs and baghouses, another particulate collection technology, effectively control relatively large particles, but these systems are less effective at controlling fine particles (smaller than 5 micrometers). Dust reentrainment after use of ESPs or after pulse-cleaning the bags in a baghouse is one of the causes of low efficiency in fine-particle collection in these devices.

Researchers at the University of North Dakota's Energy and Environmental Research Center are working with the U.S. Department of Energy to develop an Advanced Hybrid Particulate Collector (AHPC). The AHPC will combine the best features of ESPs and baghouses in a uniquely new manner. The AHPC concept consists of a combination of fabric filtration and electrostatic precipitation in the same box, providing major synergisms between the two collection modes.

In the AHPC concept, a combination of high-voltage corona-discharge electrodes and high-efficiency filtration will provide performance superior to that of a similarly sized ESP or baghouse.

Program Goal

Tighter environmental standards to take effect in the year 2000 will require U.S. coal-based power plants to be much cleaner and more efficient than today's technology allows. DOE's goal is to develop by 2010 power systems that are at least 10 times cleaner than current coal-burning plants. DOE's Advanced Power Systems Program also seeks to accelerate the commercialization of highly efficient, affordable technologies that support the use of coal—by far the Nation's most abundant energy resource—as a reliable energy source.

This project seeks to develop a highly reliable Advanced Hybrid Particulate Collector that can provide greater than 99.99% particulate-collection efficiency for all particle sizes, for use with all U.S. coals, at a cost that is competitive with existing technologies.

Project Partners

W.L. GORE & ASSOCIATES
Elkton, MD
(subcontractor / consultant)

ALLIED ENVIRONMENTAL TECHNOLOGIES (ALENTEC)
Huntington Beach, CA
(subcontractor / consultant)

UNIVERSITY OF NORTH DAKOTA—CONTROLLING TRACE ELEMENT EMISSIONS WITH THE ADVANCED HYBRID PARTICULATE COLLECTOR

CONTACT POINTS

Stanley J. Miller
University of North Dakota
Energy and Environmental
Research Center
Grand Forks, ND
(701) 777-5210
(701) 777-5181 fax
smiller@eerc.und.nodak.edu

Perry Bergman
U.S. Department of Energy
Pittsburgh, PA
(412) 892-4890
(412) 892-5917 fax
bergman@petc.doe.gov

Project Benefits

The Advanced Hybrid Particulate Collector:

- Solves the problem of excessive fine-particle emissions that lessen the effectiveness of conventional electrostatic precipitators (ESPs).
- Greatly reduces the problem of higher emissions from conventional baghouses when the air-to-cloth (A/C) ratio is increased.
- Solves the problem of reentrainment and recollection of dust in conventional pulse-jet baghouses caused by the closed-bag spacing and the effect of cleaning one row of bags at a time.
- Allows operation of fabric filters at high A/C ratios.
- Requires significantly less total collection area than conventional ESPs or baghouses, which means that the AHPC systems can be built smaller and at a lower cost, to provide more effective air toxics control than similarly sized conventional systems.
- Solves the bag problem of chemical attack that limits application of baghouses to low-sulfur coals.
- Improves the potential for mercury capture with sorbents in ESPs.
- Is suitable for new installations or as a retrofit replacement technology.

Cost Profile (Dollars in Thousands)

	Prior Investment	FY95	FY96	FY97	Future Funds**
Department of Energy *	—	$200	$200	$200	$665
Private Sector Partners	—	$57	$57	$57	$160

* Appropriated Funding
** Subject to approval of Phase II proposal

Key Milestones